How Electronic Handbooks Are Changing The Way Federal Agencies Manage Grants and Contracts

By DR. BARRY E. JACOBS

Today, the National Aeronautics and Space Administration and the US Department of Justice are successfully using an innovative Internet tool—Electronic Handbooks—to make several of their grant programs completely paperless from solicitation to post-award. Will other federal programs soon follow? It pays to look.

NASA's Small Business Innovative Research (SBIR) program and its acquisition methodology have been streamlined through the use of Electronic Handbooks. The Applicant User EHB guides the applicant through the proposal submission process.

If you have dealt with the National Aeronautics and Space Administration (NASA) and the US Department of Justice, you already know that their Electronic Handbook initiatives are dramatically changing the way proposal professionals interact with them. The entire proposal process is streamlined and completely electronic. This model is one that many other federal agencies are likely to study and adopt very soon.

Electronic Handbooks (EHBs) are Internet-based tools that support the documentation and management of complex distributed processes, such as grant programs (Gugliotta, 1997; Johnson, 1999; Hendrix, 1999; FGIPC, 1999; Friel, 1997; Harreld, 1997; Makulowich, 1998; NASA, 1998; and Steigerwald, 1997). They have been used in a number of federal programs, including NASA's Small Business Innovation Research (SBIR) Program and the Department of Justice Bulletproof Vests Partnership (BVP) Program.

NASA's SBIR Program funds small business technologies throughout the United States and constitutes roughly half of NASA's new contracts. The Department of Justice BVP program supports the purchase of bulletproof vests for US jurisdictions and law enforcement agencies, of which there are more than 80,000.

What are Electronic Handbooks?

EHBs are Internet-based tools that provide a wide variety of users with electronic forms and instructions for all steps in the grants process from solicitation to post-award.

NASA's Small Business Innovation Research (SBIR) Program. The Home Page for the NASA SBIR program (shown above at http://sbir.nasa.gov) is the entry point for applicants and provides a link to the applicants' handbooks. The Applicant User EHB enables organizations to learn about the program, register to get an account and password, electronically submit proposals, and to receive announcements and debriefings. Within NASA, other User EHBs include those of the SBIR Program Manager, Field Center Program Manager, Strategic Enterprise Representative, Topic Manager, Proposal Reviewer, and Contracts Officer.

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Department of Justice's Bulletproof Vests Partnership (BVP) Program. The Home Page for Bulletproof Vests Partnership Program (http://vests.ojp.gov) is the entry point for law enforcement jurisdictions. It provides links to jurisdictions, law enforcement agencies, vest manufacturers, and distributors handbooks. The Jurisdictions User EHB enables applicants to learn about the program, register to get an account and password, electronically submit applications, and to request electronic payments when vests are received from distributors or manufacturers. Within the Department of Justice, the BVP Program Manager has a User EHB.

The Department of Justice facilitates the purchase of bulletproof vests to law enforcement jurisdictions nationwide. The BVP Jurisdiction's User EHB guides a jurisdiction through the application submission processes.

Practical Experience and Use of EHBs

What has been the impact of EHBs on the NASA SBIR Program and the Department of Justice BVP Program? This critically important question can be answered in three ways.

Why does one move from a paper toward a paperless process? The key reasons for moving from a paper to a paperless process are cost reductions and management efficiencies in a period of tight budgets. For the Justice Department, an additional reason was to provide an effective system for a new program that had to be up and running quickly. In NASA's case, the roughly 3,000 proposals submitted each year are evaluated by more than 6,000 reviewers.

Byron Jackson, Deputy Director of the SBIR program at the Jet Propulsion Laboratory in Pasadena, California, says tracking paper flow was difficult under the old system. SBIR contract proposals are reviewed by at least two evaluators, often at different field centers. That meant that at least 6,000 reviews categorized under 120 subtopics were annually being shuffled around the country. Managing the thousands of documents associated with those proposals across 10 centers nationwide was a horrendous task.

"Now we have all the data in one place," says Jackson. "Everybody can see the same data." In the Department of Justice BVP program, there are 80,000 potentially eligible jurisdictions. "Making this program available over the Internet will enable us to reach more communities and help protect more law enforcement officers than ever before," said Attorney General Janet Reno.

Presentation of the Bulletproof Vests System to the Attorney General. Left to right: Richard Ward, Deputy Director, Bureau of Justice Assistance, DOJ; Nancy Gist, Director, Bureau of Justice Assistance, DOJ; Janet Reno, Attorney General, DOJ; Barry E. Jacobs, Research Computer Scientist, Goddard Space Flight Center, NASA; Lluanna McCann, Operations Chief, State and Local Assistance Division, Bureau of Justice Assistance, DOJ; Shyam Salona, Vice President, REI Systems.

How has the electronic process affected applicants and reviewers? In most cases, there were record-setting time and cost savings to both applicants and reviewers. In the NASA SBIR case, where some applicants submit more than 40 proposals a year, the electronic approach speeds up the review and saves money on submissions. SBIR outside reviewers are now able to access proposal abstracts in 24 hours and can access the entire proposal only several days

after the application deadline.

Jane Fox, SBIR program manager at Johnson Space Center in Houston, says she used to wait until the final deadline for contract reviews to find out if an evaluator was behind on his or her work. Now she can send reminders to employees who are falling behind. "At any point in time, I know where everyone is in the system," says Fox.

In the Department of Justice BPV program where some applicant jurisdictions have more than 10 law enforcement agencies, the electronic approach also speeds up the review and saves money on submissions. The Department of Justice reviewers are able to finalize approvals in just two days and electronic payments in five days.

How has the electronic process affected cost, quality, and administration? In both programs, costs were reduced, the quality of the grant process was enhanced, and program administration became easier. Cost savings to the NASA SBIR program were estimated at $300,000. Cost savings to the Department of Justice is harder to estimate, since it was the first time the BVP program was offered.

Better and faster communication between NASA SBIR award winners and potential NASA customers helps the overall quality and the marketing of funded research. Better and faster communication between the Department of Justice and the law enforcement agencies facilitates the distribution of bulletproof vests and thus promotes better and safer law enforcement.

Paul Mexcur, NASA's SBIR program manager, says "we expect to reduce the processing time for contracts by at least a third and may save several hundred thousand dollars a year in operating and manpower costs." He adds that "rapid access to information, retention of information, and ability to use different parts of the information in different formats for different purposes greatly enhanced administrative capabilities."

The Department of Justice Bureau of Justice Assistance (BJA) Director Nancy Gist says that "individuals who risk their lives to ensure our protection deserve fast and efficient access to equipment designed to protect." Gist adds, "this Internet system will allow BJA to get funds where they need to go quicker and, ultimately, save lives."

Components of EHBs

EHBs are made up of five components.

Binders. Binders define the product. These are used to keep track of all the data for each applicant. For example, a binder may correspond to an SBIR contract.

Processes. Processes define who produces the parts of the binder and when they produce them. Processes are made up


National Aeronautics and Space Administration
Checklist for Contract Award File Content

Sample Binder

No.	DOCUMENT	Status
PRE-SOLICITATION		
1	Procurement Request	Completed
2	Pre-Procurement Other Reviews (...)	Reassigned
3	FOIAS Applicability Determination	Completed
4	Value Characteristics (EVT only)	Reassigned
5	Presolicitation Notice	Completed
6	Presolicitation Notice Responses/Evaluations	Reassigned
7	Set-Aside Considerations/Recommendations (other than SB set-aside)	Reassigned
8	CBD - Method of Contracting, advance synopsis, non-availability, exclude a source, J&A/DC	Completed
9	Waiver of Intent to Award Grantee Contract/Wage Determination / Installation Review (service contracts)	Reassigned
10	SBA Certification and/or Other Bid Documentation	Completed
11	Advocacy and Assistance/Personal Service	Reassigned

A NASA SBIR Contract Binder contains all the items associated with a specific contract from pre-solicitation to post-award.

of *Chapters* or *Plays* used to describe individual subprocesses. Chapters are called Plays because they describe a temporal subprocess in which different roles perform different steps, and look like the manuscript of a play.

Steps of a play consist of both *Prompted Steps/Substeps* and *Report Tools. Prompted Steps/Substeps* mandate the user provide information about what is required to complete that step. *Report Tools* are used to provide tabular or graphic reports on the data in the binders and processes. Report Tools are predefined or *ad hoc.* The user can generate a predefined report with a single click of the mouse, or can generate *a* number of *ad hoc* reports

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NASA SBIR Processes

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Chapter 1 Phase I- Solicitation Development

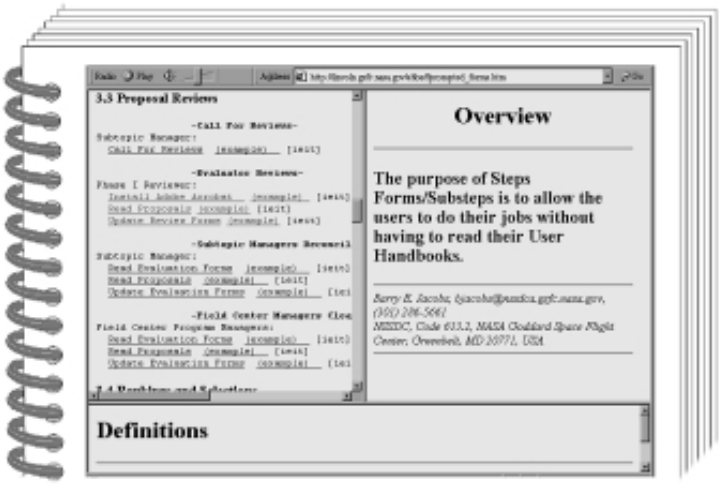
NASA's SBIR Processes define who produces the parts of the binder and when they produce each part.

from a single form that represents the report tool.

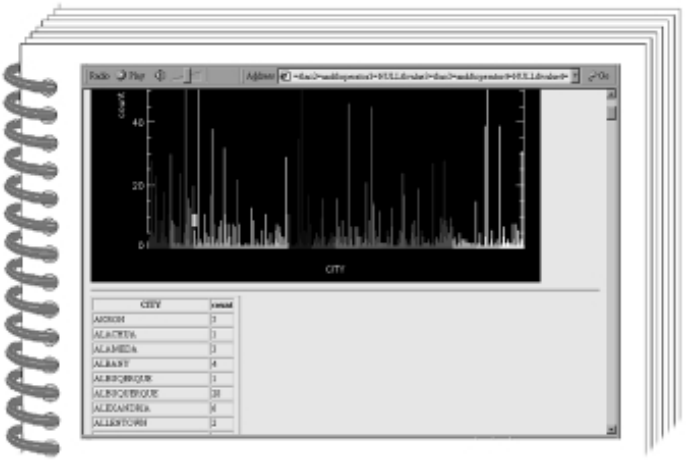
User EHBs. User EHBs define precisely how the parts of the Binders are created by each Role. For each type of user, these are used to describe their respective subprocesses. Examples of User EHBs include SBIR applicants and BVP jurisdictions, in addition to reviewers, contract managers, and program managers.

Home Pages. Home Pages provide public interfaces for prospective applicants.

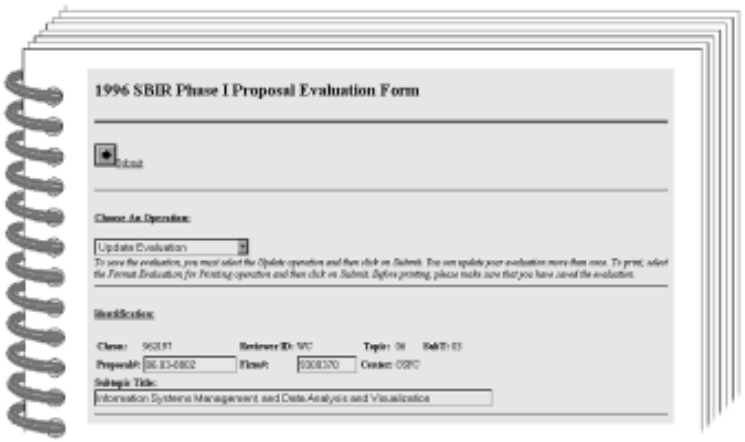
EHBs Files Architecture. EHBs Files Architecture defines the file structure of all EHB pieces, and is used in a programming-free environment. It is a tree of all text files that comprise an EHB. Each tree is broken down into many branches.



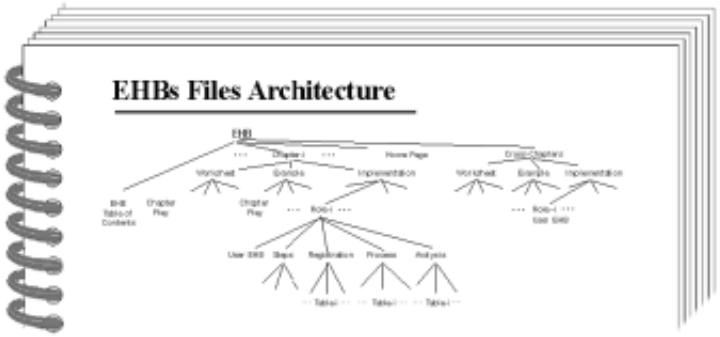
NASA's SBIR Chapters or Plays describe various subprocesses. Each Chapter or Play looks like the manuscript of a play.



NASA's SBIR Report Tool displays the distribution of proposal applications by state. It can also generate many other kinds of reports.



For NASA's SBIR Prompted Steps/Substeps, users must provide information to complete each step.



The EHBs Files Architecture used by NASA and the Department of Justice provides a paperless infrastructure for the entire Electronic Handbook.

EHBs Architecture

The EHBs Architecture is composed of four parts: *Participation*, *System*, *Security*, and *Files*.

Participation. There are three dimensions of EHBs participation:

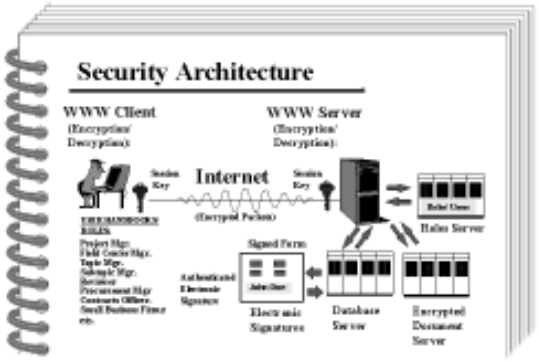
- *Top-to-Bottom participation* means that EHBs involve users across all levels of process management.
- *Coast-to-Coast participation* means that EHBs involve users located across physically separated sites.
- *Cradle-to-Grave participation* means that EHBs involve users across all connected subprocesses.

System. End users and EHBs both use the Internet.

EHBs Participation Architecture represents three dimensions of user participation: top-to-bottom, coast-to-coast, and cradle-to-grave.

The end user interacts via a World Wide Web client such as Internet Explorer, AOL, or Netscape. The EHBs system interacts through several servers: World Wide Web, Database Management System, Graphics Report, Legacy System, and Middleware. Examples of Middleware include DBGenie, Cold Fusion, and Dynamic Forms. The entire EHB system uses Commercial-Off-the-Shelf (COTS) components.

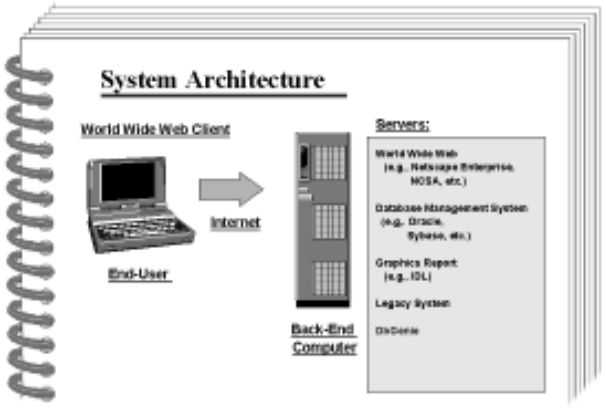
Security. End users and the EHBs system implement security through the Internet. The end user interacts via a User EHB through a secure password and role mechanism. The EHBs system interacts through several servers: World Wide Web, Roles, Database Management System, Encrypted Document, and an Electronic Signature System.



EHBs Security Architecture provides information in the Electronic Handbook on a secure need-to-know basis. This is critically important because proposals may contain valuable intellectual property.

Security is a critical requirement, especially in the case of government-sponsored grant programs. Grantees who lose valuable intellectual property due to system security lapses could sue the Government for major financial loses. In addition, they may complain to their Congressional representatives, who then might slash the offending agency's budget or carry out other forms of retribution.

Files. This is used as a programming-free environment. It is a tree of all of the text files that comprise an EHB.



EHBs System Architecture relates the user software to the system software. The end user interacts via a World Wide Web client.

Applications of EHBs

In addition to grants and contract programs, EHBs technology can be applied to different information-based applications in federal agencies.

E-Science. This is the process where investigators perform collaborative scientific investigations. In this process, scientific investigations are formulated by adding co-investigators, inputs, proposals, sponsors, experiments, activities, and outputs. Roles include the scientific investigations manager, investigator, and sponsor.

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Policies and Procedures. This is the process agencies use to prepare and review policies and procedures used to manage the entire organization.

Proposal Development. This is the process organizations use to prepare internal proposals that are outlined, developed, and reviewed through blue and red team evaluations.

Public Affairs. This is the process organizations use to prepare articles and press releases.

Programs and Projects. This is the process through which individuals or groups manage large-scale programs and projects across an entire organization.

EHB-to-Build-EHBs. This is the process where all EHBs are actually built. In this process, EHBs are proposed, designed, reviewed, implemented, tested, and put into operation.

EHB-to-Build-EHBs

The EHB-to-build-EHBs is the mother of all EHBs. Each EHB is developed in three stages: Worksheet, Example, and Implementation. In all three stages, developers define the parts of the EHB—binders, processes, user EHBs, home page, and files architecture. Since all three stages are available on the World Wide Web, developers can get feedback from potential users as the EHB is built.

Worksheet. In the first stage, binders, processes, user EHBs, home page, and files architecture are created in a worksheet format. The result is an outline of the entire EHB.

Example. In the second stage, binders, processes, user

"We expect to reduce the processing time for contracts by at least a third and may save several hundred thousand dollars a year in operating and manpower costs."

—Paul Mexcur,
NASA SBIR Program Manager

So What is SBIR/STTR?

By JOHN DAVIS

With approximately 60,000 proposals submitted annually, one of the most active proposal arenas in federal government contracting is the SBIR Program (referred to in Barry Jacobs's article on Electronic Handbooks). SBIR is an acronym for Small Business Innovative Research.

BACKGROUND

The SBIR program was created in 1982 with the enactment of the Small Business Innovation Development Act, was strengthened by Congress in 1992, and is currently under active consideration for reauthorization.

An almost identical program, Small Business Technology Transfer (STTR)—which requires the for-profit bidder to team with a not-for-profit research institution such as a university, hospital, or government laboratory—is about one-sixth the size of the SBIR Program and is generally operated by the same agency personnel. STTR has to be reauthorized annually instead of every eight years like SBIR. When using the term SBIR, STTR is often included by implication.

STATED OBJECTIVES OF THE PROGRAMS

Designed as a pro-small business

Group critiques not only improve the User EHB but also provide critically important "buy-in" by potential users since they helped design the product.

EHBs, home page, and files architecture are created by building HTML examples of what the final products will look like to the end user. These examples can be presented to end-user focus groups for comments.

Implementation. In this final stage, the example binders, processes, user EHBs, home page, and files architecture are programmed into databases and then presented to end-user focus groups for comments.

In general, one does not build a complete EHB from start to finish. Rather, one builds one Chapter or Play at a time. Roughly speaking, a chapter may take about two months from design (worksheet and example phases) before it is implemented.

For example, at NASA the chapters were built over several years in the following general order: review and selections; solicitation development; proposal submissions; award initiation and negotiations; post-award; and award management and closeout. An agency interested in building an EHB would initially bring in specialized EHB authors, implementers, and help desk personnel. Ideally, as these specialists build and maintain EHBs, they would also train local staff to develop EHBs.

The time and cost to develop an entire EHB is a function of several factors: the complexity of the process, the availability of the details of the process, and whether or not the EHB can be built from a similar existing EHB. For example, NASA's SBIR EHB comprises 16 chapters (each with an aver-

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engine for research and technical innovation, the SBIR/STTR Programs have four principal stated objectives:

1. To stimulate technological innovation by small business.
2. To increase small business participation in meeting federal research and development needs.
3. To increase the commercialization of technology developed through SBIR research and development.
4. To increase the participation of socially and economically disadvantaged small business concerns and the participation of small businesses that are at least 51 percent owned and controlled by women.

A REAL OPPORTUNITY TO COMPETE

Research and development are clearly major factors in the growth and advancement of American industry. Moreover, it is widely recognized that small businesses have played a highly successful role in developing critical technology innovations, especially for the government. However, the expense of carrying on a serious research and development (R&D) program is often beyond the means of most small business concerns. This puts them at an immediate competitive disadvantage in the marketplace. The SBIR program is supposed to help level the playing field.

Through the SBIR Program, small R&D businesses can compete for federal research contracts. Through the government's front-end funding of this early stage, high risk research allows the best ideas to surface. At the tail end of the process, SBIR offers small businesses the opportunity to commercialize the results of their SBIR projects while serving to lower the risk for private investors.

Thousands of small businesses nationwide have already obtained

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age of 50 steps), and the entire EHB is made up of more than 40 roles. Since NASA's SBIR process spans multiple offices and divisions, there was no single resource that could be used to identify all process details.

NASA's SBIR EHB took a very long time to develop because it was the first of its kind. Other grant program EHBs, such as those of NASA's Earth Science Technology Program, usually have only six chapters (solicitation development, proposal submission, review and selection, award initiation and negotiations, award management and closeout, and post-award), and each was derived from NASA's existing SBIR EHB.

Lessons Learned

Several lessons have been learned during the development and implementation of EHBs that should help NASA, the Department of Justice, and other government agencies use EHBs more efficiently and effectively to streamline the proposal process.

Quickly Develop the Big Picture. When developing EHBs, it is important to first outline the entire process across all Chapters. This provides the developer and others with an overall perspective and a sense of all the possible user EHBs. Basically, it provides a top-down "road map" of the entire process.

Utilize Example User EHBs for Requirement Capture. When capturing requirements, it is important to use Example User EHBs. They look exactly like the final User EHBs but have simulated data. This enables developers and eventual users to precisely visualize the system and to make concrete suggestions about improvements.

Employ User EHBs Focus Groups. When developing EHBs, it is important to utilize user focus groups corresponding to different User EHBs. Each focus group can meet physically or electronically through the Internet or teleconferencing. Group critiques not only improve the User EHB but also provide critically important "buy-in" by potential users since they helped design the product.

Keep User EHBs Simple. Large, complex, and unwieldy User EHBs tend to intimidate and discourage potential users. The User EHB should act as an online tutorial to explain users' subprocesses. Keeping the User EHB sim-

"SBIR outside reviewers are now able to access proposal abstracts in 24 hours."

public and private sector contracts through SBIR and are now well on their way to becoming successful and self-supporting enterprises.

PROGRAM ADMINISTRATION

The SBIR Program is administered by the Small Business Administration, but that is not where funding occurs. Each agency that participates in the program has its own program manager and staff to administer SBIR/STTR programs.

Ten federal agencies (the Department of Defense (DoD), Energy (DoE), Agriculture (USDA), Education (DoEd), Commerce (DoC), Health and Human Services (HHS), Transportation (DoT), the National Aeronautics and Space Administration (NASA), the National Science Foundation (NSF), and the Environmental Protection Agency (EPA)) are required to set aside 2.5 percent of their extramural R&D budgets exclusively for SBIR contracts. At more than $500 million, DoD's program is the largest, with HHS in second place with $300 million. As departments, however, the National Institutes of Health manages the largest budget of almost $300 million with the Air Force coming in second at $193 million.

STTR is only offered at the five agencies with the largest R&D budgets—DoD, HHS, DoE, NASA, and NSF. STTR only receives one-half percent of the agencies'R&D budgets, but together with SBIR the total for them is 3 percent. Altogether, the SBIR and STTR Programs annually award more than $1.3 billion to inventors and small businesses to investigate and commercialize technologies.

Each of the participating agencies identifies various problems and needs that find their way into lists of R&D topics thought to require innovative solutions. These topics are then bundled together into 18 different

ple promotes user learning and an enhanced understanding of their responsibilities.

Steps/Substeps Should Be Self-Explanatory. Users want to do their jobs as fast as possible and do not want to spend time reading unnecessary instructions. User EHBs steps should be self-explanatory so that users can be quickly prompted through the subprocesses.

Learn From the Help Desk. When users have difficulties with their User EHBs, they often call the User Help Desk. Their problems should be recorded. Since the EHBs infrastructure is so flexible, most User EHBs can be quickly updated to eliminate any difficulties.

If these lessons are incorporated into future EHB design, proposal professionals will be working in a faster and more open environment. Electronic commerce will change the way everyone from both inside and outside the government deals with proposals from the very beginning of the solicitation process to the end of the contract.

Conclusion: The Advantages of Using EHBs

Compared to current paper-based processes, there are many advantages to using EHBs to manage federal grant and contract programs. As listed below, EHBs facilitate the seven stages of system development included in all information technology-based grant and contract programs.

Requirements Capture. User EHBs reduce requirements capture costs. A Grants Program Manager can precisely communicate requirements to the end user by specifying the User EHB for that role. In addition, a Grants Program Manager can get feedback from potential end-users by displaying the user EHB on the Internet.

Design. User EHBs reduce design costs. Unlike other systems where there are system and user guides, *the system is the User Guide*. Consequently, there is no need for design once the requirements are captured via user EHBs.

Implementation. EHB file architecture reduces implementation costs because the EHB tree structure supports the use of Middleware, which eliminates a great deal of programming. Cost savings will depend on the type of Middleware used to bridge the EHBs and the database.

Distribution. EHBs reduce software distribution costs. This is because User EHBs are accessible via popular World Wide Web browsers.

Learning. User EHBs reduce end-user learning costs because User EHBs are self-documenting. User EHBs can lead the user step-by-step through the grants or contract process, and the availability of telephone accessible help

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agency-specific solicitations, which are distributed to interested individuals and small businesses.

THE PROPOSAL/ GRANT REQUEST RESPONSE

The small business or individual inventor receiving one of these packages reviews the identified topics to determine if any are of interest. Applicants respond with a 25-page proposal. Typically, there will be 3-6 pages of forms included in the 25-page count limit.

PROPOSAL EVALUATION CRITERIA

SBIRs are awarded competitively and take the following into account:

- The qualifications of the principal investigator and any other key staff
- The soundness and technical merit of the proposed approach
- The potential commercial applications for the technology
- The adequacy of the proposed effort to fulfill the requirements expressed in the research topic

As the SBIR program emphasizes innovation, special consideration is given to the originality of the concept in solving technological challenges identified in the solicitation. This is a place in federal contracting where just addressing the government's problem is not enough by itself. In the SBIR program, the proposed solution must represent a demonstrable commercial business opportunity for the bidder.

THE PROGRAM PLAN

The winner of an SBIR grant enters into Phase I of the program. Phase I grants are fixed price contracts and can be up to $100,000. They support research efforts lasting approximately 6-9 months. Phase I is pri-

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desks also promotes end-user learning.

Maintenance. EHB file architecture reduces system maintenance costs because the EHB tree structure is self-contained and supports the use of Middleware, which eliminates a great deal of programming.

Adaptability to Similar Processes. EHB file architecture reduces adaptation costs because the EHB tree structure is self-contained and supports the use of Middleware, which eliminates a great deal of programming.

"The process of writing EHBs lends itself to a common understanding of the activity the handbook is documenting," says Wayne Hudson, former Chief of NASA's Goddard Space Flight Center Technology Commercialization Office. "This is a tremendous benefit because many conflicts start from different understandings of the activity and its objectives. The EHBs yield a shared vision."

EHBs have saved federal agencies precious time and money while simultaneously enhancing the administration of their programs. In an EHB environment, everyone benefits—government officials, applicants, outside reviewers, and the general public.

EHBs are fundamentally changing the way proposal professionals work with federal agencies.

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marily intended to assess the feasibility of a new technology or concept.

Phase II awards are not as competitive and go to about half of the Phase I winners. These cost plus contracts can be for up to $750,000 and are typically for projects with a two-year duration. Awards for Phase II are based on the Phase I results and the scientific and technical merit of the Phase II Proposal. They are supposed to support the refinement, prototyping, and testing of the innovative concepts.

Phase III involves either private sector or federal agency funding (but funds must come from outside the SBIR program) to commercialize the technology.

ELIGIBILITY TO PARTICIPATE

To participate in the program, the Phase I SBIR bidder must qualify as a small business as defined by the federal government. In most cases, a small business:

- Is independently owned and operated
- Is organized as a for-profit venture
- Has its principal place of business in the USA
- Is at least 51 percent owned by U.S. citizens/resident aliens
- Has no more than 500 employees

John Davis is General Manager of JADE Research Corporation, a commercial provider of business development resources to the SBIR community, including software-based proposal development tools and tutorials, bid information searches, bid matching services, direct consulting, and customized tools for SBIR/STTR procurements. Davis can be contacted at (410) 315-8101 or through his Web site: www.win-sbir.com.